MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 21-03-11

Borehole Information

Farm : BX	**Tank :** BX-103	**Site Number :** 299-E33-275
N-Coord : 45,631	**W-Coord :** 53,282	**TOC Elevation :** 653.90
Water Level, ft : 94.60	**Date Drilled :** 01/1976	

Casing Record

Type : Steel-welded	Thickness : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:
No construction details or driller's log was available for borehole 21-03-11. On the basis of the borehole location and site number (299-E33-275), it is assumed that the borehole was completed in about January 1976 (the date of completion for boreholes 299-E33-274 and 299-E33-277). The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing. No information concerning grouting or perforations was available; therefore, it is assumed that the borehole was not grouted or perforated.

The top of the casing, which is the zero reference for the SGLS, is about 0.5 ft below the ground surface. The borehole was water filled below a depth of 94.6 ft; the total logging depth achieved by the SGLS was 98.5 ft.

Equipment Information

Logging System : 1B	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 02/1997	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number :	1	**Log Run Date :**	06/04/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	98.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	15.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	06/05/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	16.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	06/05/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	50.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	35.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Analysis Information

Analyst : D.L. Parker

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 11/12/1997

Analysis Notes :

This borehole was logged by the SGLS in three log runs, with a re-log of a portion of the borehole as a quality check. The pre-survey and post-survey field verification spectra met the acceptance criteria established for the peak shape and detector efficiency, confirming that the SGLS was operating within specifications. The energy calibration and peak-shape calibration from the spectra that best matched the data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation. No fine gain adjustments were necessary during logging of this borehole. Water was encountered at a depth of 94.6 ft in this borehole.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis. A water-correction factor was added to data collected from depths below the water level.

The man-made radionuclides Cs-137 and Co-60 were detected in this borehole. Cs-137 contamination was detected continuously from the ground surface to 8 ft and 11.5 to 12 ft. The maximum Cs-137 concentration was 1.95 pCi/g at 5 ft. Co-60 contamination was detected only at 40 ft at a concentration of 0.08 pCi/g.

The K-40 concentrations increase gradually from 1 to 5.5 ft and remain at about 12 pCi/g from 5.5 to 7 ft. K-40 concentrations decrease sharply at 7.5 ft and remain relatively low (about 5 to 6 pCi/g) from about 8 to 20 ft. K-40 concentrations increase sharply at 20 ft to a background of about 13 pCi/g and remain at about this concentration to 39 ft. K-40 concentrations increase to a background of about 17 pCi/g at about 41 ft.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank BX-103.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A rerun plot was generated for the region between 35 and 50 ft. The radionuclide concentrations shown were calculated using the separate data sets provided by the original and rerun logging runs.

A plot of the spectrum shape factors is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.